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Student Monitoring System

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***Abstract*: Automatic face recognition (AFR) technologies have brought improvements in the changing world. Automatic Attendance using Real-Time Face Recognition is a solution which comes with day to day activities of handling student attendance. Face recognition-based attendance system is a process of recognizing the students face for taking attendance by using face biometrics based on monitor video and other information technology. In our face recognition project, a computer system will be able to find and recognize human faces quickly and accurately in images or videos that are being captured through a surveillance camera. A lot of algorithms and techniques have been developed for improving the performance of face recognition. It helps in conversion of the frames from the video into images so that it is easy to recognize face of the student for their attendance and the attendance database can be easily reflected automatically.**

***Keywords*: Face detection, Face recognition.**

1. Introduction

The technology focuses imparting tremendous knowledge oriented technical innovations these days. Deep Learning is one among the interesting domains that enables the machine to train itself by providing some datasets as input and provides an appropriate output during testing by applying different learning algorithms. Nowadays Attendance is an integral part for both the student as well as the teacher of an educational organization. With the advancement of deep learning technology, the machine automatically detects the attendance of the students and maintains a record of those collected data.

In general, the attendance system of the student can be maintained in two different forms:

- Manual Attendance System (MAS)
- Automated Attendance System (AAS)

Manual Student Attendance System is a process where a teacher needs to call the students name and mark the attendance manually. Manual attendance is a time-consuming process or sometimes it happens for the teacher to miss someone or students may answer multiple times in the absence of their friends resulting in inaccuracy.

The problem arises when we think about the traditional process of taking attendance in the classroom. To solve all these issues, we adopt Automatic Attendance System (AAS). Automated Attendance System (AAS) is a process to automatically mark the presence or the absence of the student in the classroom by using facial recognition technology. It can also be implemented in the exam sessions to ensure the presence of the student. The presence of the students can be determined by capturing their faces on a monitor video streaming service, so it becomes highly reliable for the machine to understand the presence of all the students in the classroom. The two common Human Face Recognition techniques are:

- Feature-based approach
- Brightness-based approach

The Feature-based approach also known as local face recognition system, used in pointing the key features of the face like eyes, ears, nose, mouth, edges, etc., whereas the brightness-based approach also termed as the global face recognition system, used in recognizing all the parts of the image.

2. Literature Survey

1) A Counterpart Approach to Attendance and Feedback System using Machine Learning Techniques

In this paper, the idea of two technologies namely Student Attendance and Feedback system has been implemented with a machine learning approach. This system automatically detects the student performance and maintains the student's records like attendance and their feedback on the subjects like Science, English, etc. Therefore, the attendance of the student can be made available by recognizing the face. On recognizing, the attendance details and details about the marks of the student is obtained as feedback.

2) Automated Attendance System Using Face Recognition

Automated Attendance System using Face Recognition proposes that the system is based on face detection and recognition algorithms, which is used to automatically detect the student face when he/she enters the class and the system is capable of marking the attendance by recognizing him. Viola-Jones Algorithm has been used for face detection which detects human face using cascade classifier and PCA algorithm for feature selection and SVM for classification. When it is compared to traditional attendance marking this system saves the time and also helps to monitor the students.

3) Student Attendance System Using Iris Detection

In this proposed system the student is requested to stand in front of the camera to detect and recognize the iris, for the system to mark attendance for the student. Some algorithms like Gray Scale Conversion, Six Segment Rectangular Filter and Skin Pixel Detection are being used to detect the iris. It helps in preventing proxy issues and it maintains the attendance of the student in an effective manner, but it is a time-consuming process for a student as well as staff to wait until the completion

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of iris detection of the previous members.

4) Face Recognition-based Lecture Attendance System

This paper proposes that the system takes the attendance automatically on the basis of recognition of continuous observation. Continuous observation helps in improving the performance of the system. To obtain the attendance, face images of the students present in the classroom are captured. The effectiveness of the picture is being discussed to enable the faster recognition of the image.

3. Existing Recognition Systems

1) Fingerprint Based Recognition System

In the Fingerprint based existing attendance system, a portable fingerprint device needs to be configured with the student's fingerprint earlier. Later either during the lecture hours or before, the student needs to record the fingerprint on the configured device to ensure their attendance for the day. The problem with this approach is that during the lecture time it may distract the attention of the students. Also it adds additional expense to install portable fingerprint devices.

2) RFID (Radio Frequency Identification) Based recognition system

In the RFID (Radio Frequency Identification) based existing system, the student needs to carry a Radio Frequency Identity Card with them and place the ID on the card reader to record their presence for the day. The system is capable of connecting to RS232 and recording the attendance to the saved database. There are possibilities for the fraud. Inappropriate access may occur. Some students may make use of other student's ID to ensure their presence when the particular student is absent or they even try to misuse it sometimes.

3) Iris Based Recognition System

In the Iris based student attendance system, the student needs to stand in front of a camera, so that the camera will scan the Iris of the student. The scanned iris is matched with data of students stored in the database and the attendance on their presence needs to be updated. This reduces the paper and pen workload of the faculty member of the institute. This also reduces the chances of proxies in the class, and helps in maintaining the student records safe. It is a wireless biometric technique that solves the problem of spurious attendance and the trouble of laying the corresponding network. But it has the drawback of installation of expensive iris scanner.

4) Face Based Recognition System

The facial recognition technology can be used in recording the attendance through a digital camera that detects and recognizes the faces of the students and the machine compares the recognized face with students' face images stored in the database. Once the face of the student is matched with the stored image, then the attendance is marked in the attendance database for further calculation.

4. Proposed System

The task of the proposed system is to detect faces through the surveillance camera already present in the classroom and match it in the database comprising of student's photographs. Once the face of the student is detected and matched in the database, the system should mark the attendance of the student in an Excel Sheet. There is no need for the teacher to manually take attendance in the class. Also an email is sent to the parents of the students who are present.

5. Methodology

The main working principle of the project is that the video captured data is converted into image to detect and recognize the faces of the student. Further the recognized image of the student is provided with attendance.

1) Capturing Video

The Camera is fixed at a specific distance inside a classroom to capture videos of the frontal images of the entire students of the class.

2) Converting the video into frames

The captured video is converted into frames per second for easier detection and recognition of the students' face to generate the attendance database.

3) Face Detection

Face Detection is the process where the image, given as an input (picture) is searched to find any face, after finding the face the image processing cleans up the facial image for easier recognition of the face. While using OpenCV, we first need to convert the image from BGR format to RGB format.

Fig. 1. BGR to RGB color format scheme

4) Face Recognition

Here we use a method called Histogram of Oriented Gradients (HOG) to detect faces. In this method we look at every single pixel in our image one at a time. For every single pixel, we want to look at the pixels that directly surrounds the selected pixel. Our aim is to figure out how dark the current pixel is compared to the surrounding pixels. Then we want to draw an arrow showing in which direction the image is getting darker. If we repeat this process for every single pixel in the image, we end up with every pixel being replaced by an arrow. These arrows are called gradients and they show the flow from light to dark across the entire image.

This approach helps to refer to same person in very dark lighting as well as very light lighting. But saving the gradient for every single pixel gives us way too much detail. We just need to see the basic flow of lightness/darkness at a higher level so we could see the basic pattern of the image. To do this, we'll break up the image into small squares of 16x16 pixels each. In each square, we'll count up how many gradients point in each major direction. Then we'll replace that square in the image with the arrow directions that were the strongest.

One more important aspect in facial recognition recognizing the face in any pose. This is done by encoding various points on a face and comparing them. For example, distance between the eyes, length of the nose, etc. In total, 128 landmarks are encoded for a face to be recognized.

Fig. 2. Face encoding

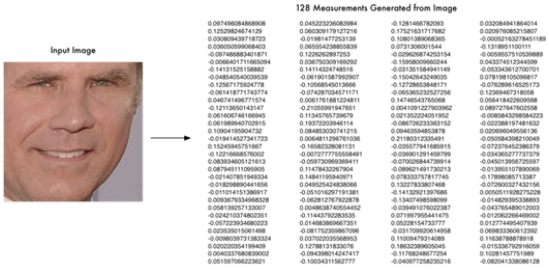

Fig. 3. 128 Encoding measurements generated from an image

5) Post Processing

The post-processing mechanism involves the process of updating the names of the student into a csv file. This is also maintained in an excel sheet. We also send an email to the parents of the student who were present.

6. Conclusion

This paper represented an overview on student monitoring system.

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